USB-SSR08

USB-based 8 Solid-state Relay Module Interface Device

User's Guide

MEASUREMENT COMPUTING

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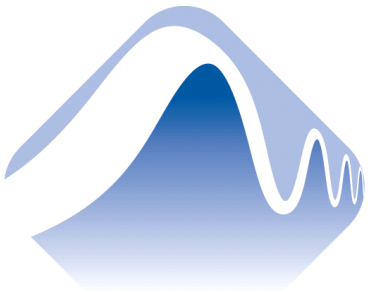

MEASUREMENT COMPUTING™

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About this User's Guide

What you will learn from this user's guide

This user's guide explains how to install, configure, and use the USB-SSR08 so that you get the most out of its solid state relay features. This user's guide also refers you to related documents available on our web site, and to technical support resources.

Conventions in this user's guide

For more information on …

Text presented in a box signifies additional information and helpful hints related to the subject matter you are reading.

Caution! Shaded caution statements present information to help you avoid injuring yourself and others, damaging your hardware, or losing your data.

<#:#> Angle brackets that enclose numbers separated by a colon signify a range of numbers, such as those assigned to registers, bit settings, etc.

bold text **Bold** text is used for the names of objects on the screen, such as buttons, text boxes, and check boxes. For example:
1. Insert the disk or CD and click the **OK** button.

italic text *Italic* text is used for the names of manuals and help topic titles, and to emphasize a word or phrase. For example:
The *Insta*Cal installation procedure is explained in the *Quick Start Guide*.
Never touch the exposed pins or circuit connections on the board.

Where to find more information

The following electronic documents provide information relevant to the operation of the USB-SSR08.

- MCC's *Specifications: USB-SSR08* (the PDF version of the *Specifications* chapter in this guide) is available on our web site at www.mccdaq.com/pdfs/USB-SSR08.pdf.
- MCC's *Quick Start Guide* is available on our web site at www.mccdaq.com/PDFmanuals/DAQ-Software-Quick-Start.pdf.
- MCC's *Guide to Signal Connections* is available on our web site at www.mccdaq.com/signals/signals.pdf.
- MCC's *Universal Library User's Guide* is available on our web site at www.mccdaq.com/PDFmanuals/sm-ul-user-guide.pdf.
- MCC's *Universal Library Function Reference* is available on our web site at www.mccdaq.com/PDFmanuals/sm-ul-functions.pdf.
- MCC's *Universal Library for LabVIEW™ User's Guide* is available on our web site at www.mccdaq.com/PDFmanuals/SM-UL-LabVIEW.pdf.

USB-SSR08 User's Guide (this document) is also available on our web site at www.mccdaq.com/PDFmanuals/USB-SSR08.pdf.

Introducing the USB-SSR08

Overview: USB-SSR08 features

This user's guide contains all of the information you need to connect the USB-SSR08 to your computer and to the external devices you want to control.

The USB-SSR08 is a USB 2.0 high-drive, full-speed, solid state relay board supported under popular Microsoft® Windows® operating systems.

The USB-SSR08 is a mounting rack for eight solid state relay (SSR) modules. The backplane is divided into two groups of four modules each. You set the module type for each group with an on-board switch. You cannot mix input and output modules within a group. The following configurations are possible.

- Four input and four output modules
- Eight input modules
- Eight output modules

The control logic polarity for each module group is switch-settable for active high or low (default) logic with an on-board switch. The power-up state for output modules is switch-settable with an on-board switch. Independent LEDs at each module position indicate the on/off status of each module. Switch settings can be read back with software.

The USB-SSR08 has eight pairs of screw terminals for your field wiring connections. Positive (+) and negative (-) relay contacts are brought out to the screw terminals.

The USB-SSR08 is powered by an external 9 V, 1 A regulated power supply that is shipped with the device. A USB cable is also included. USB out and power out connections let you power and control multiple MCC USB Series boards from one external power source and one USB port in a daisy chain fashion. Depending on your load requirement, daisy chained boards may require a separate power supply.

The USB-SSR08 is shipped in a rugged metal enclosure that you can mount on a DIN rail or on a bench.

Compatible SSR modules

The USB-SSR08 board has locations for eight solid state relay modules that you can install in your USB-SSR08 board. The SSR modules use a standard color scheme so you can quickly identify what module type is installed. Mounting screw threads are provided for you to easily install the SSR modules.

MCC offers SSR modules that are compatible with the USB-SSR08:

- SSR-IAC-05
- SSR-IAC-05A
- SSR-IDC-05
- SSR-IDC-05NP
- SSR-OAC-05
- SSR-OAC-05A
- SSR-ODC-05
- SSR-ODC-05A
- SSR-ODC-05R

Details on these SSR modules are available from our web site at www.mccdaq.com/cbicatalog/directory.asp?dept_id=246&top_id=25.

Remove the USB-SSR08 from the enclosure to install SSR modules

You must remove the USB-SSR08 from the enclosure to access the solid state relay module mounting positions.

USB-SSR08 block diagram

USB-SSR08 functions are illustrated in the block diagram shown here.

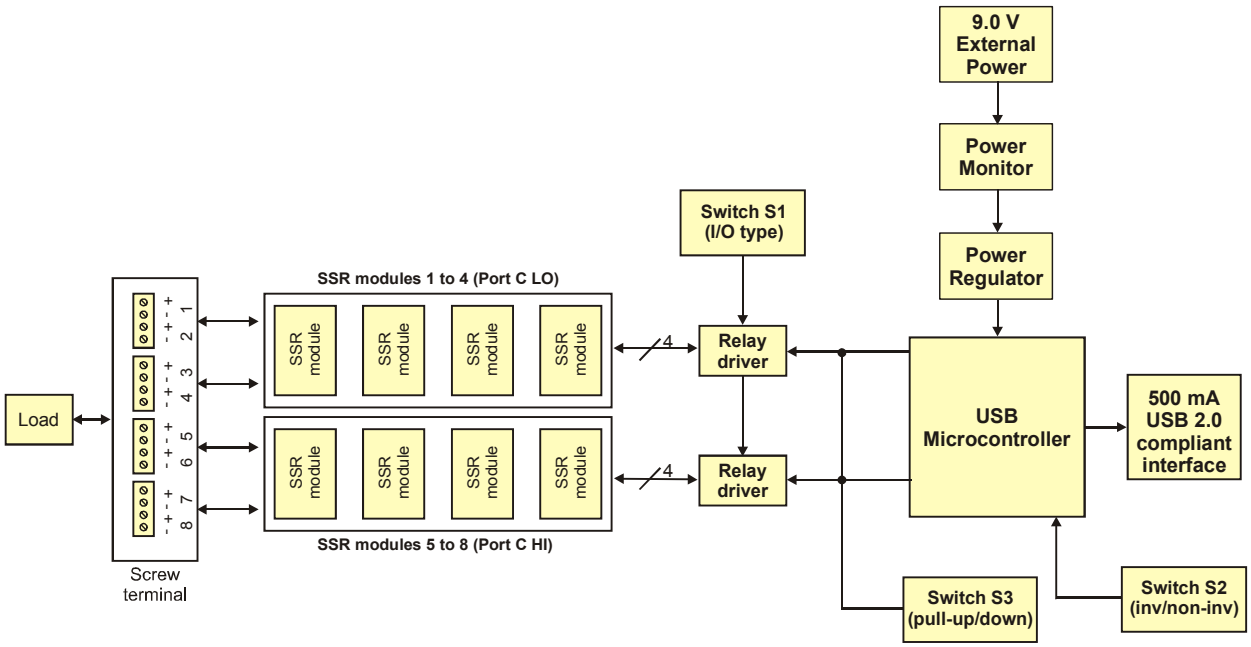


Figure 1-1. USB-SSR08 functional block diagram

Software features

For information on the features of *Insta*Cal and the other software included with your USB-SSR08, refer to the *Quick Start Guide* that shipped with your device. The *Quick Start Guide* is also available in PDF at www.mccdaq.com/PDFmanuals/DAQ-Software-Quick-Start.pdf.

Check www.mccdaq.com/download.htm for the latest software version or versions of the software supported under less commonly used operating systems.

Connecting a USB-SSR08 to your computer is easy

Installing a data acquisition device has never been easier.

- The USB-SSR08 relies upon the Microsoft Human Interface Device (HID) class. The HID class ships with every copy of Windows that is designed to work with USB ports. We use the Microsoft HID because it is a standard, and its performance delivers full control and maximizes data transfer rates for your USB-SSR08. No third-party device driver is required.
- You can connect the USB-SSR08 before or after you install the software, and without powering down your computer first.
- When you connect an HID to your system, your computer automatically detects it and configures the necessary software. You can connect and power multiple HID peripherals to your system using a USB hub.
- You can connect your system to various devices using a standard four-wire cable. The USB connector improves upon serial and parallel port connectors with one standardized plug and port combination.
- Data can flow two ways between a computer and peripheral over USB connections.

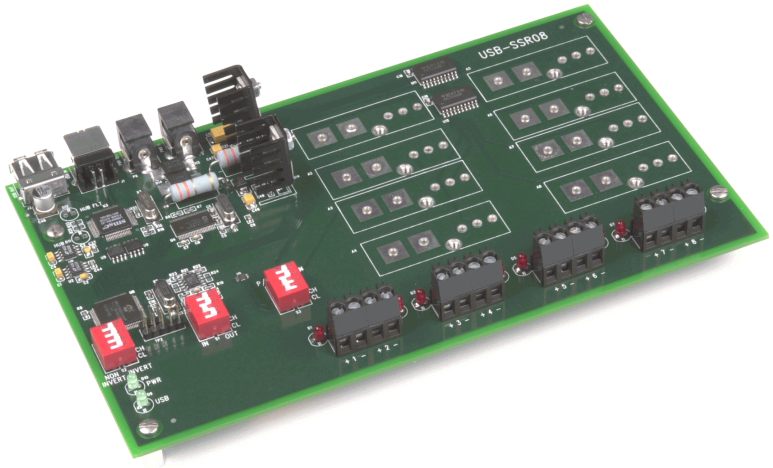
Installing the USB-SSR08

What comes with your USB-SSR08 shipment?

As you unpack your USB-SSR08, make sure that the following components are included.

Hardware

- USB-SSR08



- External power supply and cord (CB-PWR-9) – 9 volt, 1 amp DC power supply

- USB cable (2 meter length)

Additional documentation

In addition to this hardware user's guide, you should also receive the *Quick Start Guide* (available in PDF at www.mccdaq.com/PDFmanuals/DAQ-Software-Quick-Start.pdf). This booklet supplies a brief description of the software you received with your USB-SSR08 and information regarding installation of that software. Please read this booklet completely before installing any software or hardware.

Unpacking the USB-SSR08

As with any electronic device, you should take care while handling to avoid damage from static electricity. Before removing the USB-SSR08 from its packaging, ground yourself using a wrist strap or by simply touching the computer chassis or other grounded object to eliminate any stored static charge.

If your USB-SSR08 is damaged, notify Measurement Computing Corporation immediately by phone, fax, or email. For international customers, contact your local distributor where you purchased the USB-SSR08.

- Phone: 508-946-5100 and follow the instructions for reaching Tech Support.
- Fax: 508-946-9500 to the attention of Tech Support
- Email: techsupport@mccdaq.com

Installing the software

Refer to the *Quick Start Guide* for instructions on installing the software on the *Measurement Computing Data Acquisition Software CD*. This booklet is available in PDF at www.mccdaq.com/PDFmanuals/DAQ-Software-Quick-Start.pdf.

Installing the USB-SSR08

Before you connect the USB-SSR08 to your computer, configure the hardware and then connect the external power supply that was shipped with the device. You can connect up to four MCC USB Series products in a daisy chain configuration to a single USB 1.1 port or USB 2.0 port on your computer.

Configuring the hardware switches

The USB-SSR08 has three on-board switches that you set to configure the I/O module type, relay logic polarity, and relay power-up state. Configure these switches before you connect the external power supply to the USB-SSR08. Factory-configured default settings are listed in Table 2-1. Refer to Figure 3-1 for the location of each switch.

Table 2-1. Default switch configuration

Board label	Description	Default setting
IN OUT (S1)	Configures the I/O type per module group for input or output.	OUT (output)
NON INVERT INVERT (S2)	Configures the relay logic parity per module group for invert or non-invert logic.	NON INVERT (active low)
P/UP P/DN (S3)	Configures the power-up state of output relays for pull-up or pull-down.	P/UP (Pull-up)

Each DIP switch sets the configuration of one module group. The switch labeled **CL** configures modules 1 through 4, and the switch labeled **CH** configures modules 5 through 8.

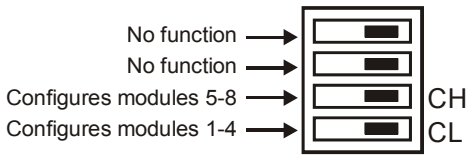


Figure 2-1. Typical board switch

You can use *Insta*Cal to read the current configuration of each switch.

Remove from the enclosure to access the on-board switches

To change the configuration of a switch, you must first remove the USB-SSR08 from the enclosure. Turn external power off before changing the switch settings

I/O module type

Configure switch **S1** to set the type of each module group for input or output. By default switch S1 is shipped with all modules configured for output, as shown in Figure 2-2.

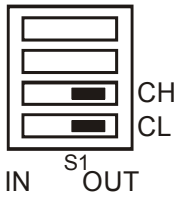


Figure 2-2. I/O module type switch (S1)

You cannot mix input and output modules within a group.

Control logic polarity

Configure switch **S2** to set the control logic polarity for each module group for inverted (active high) or non-inverted (active low, default) logic. By default, this switch is shipped with all banks configured for non-inverted logic, as shown in Figure 2-3.

Figure 2-3. Relay logic switch (S2)

- For input modules, **invert** mode returns a "1" when the modules are active. **Non-invert** mode returns a "0" when the modules are active.
- For output modules, **invert** mode allows you to write a "1" to activate the module. **Non-invert** mode allows you to write a "0" to activate the module.

Relay power-up state

Configure switch **S3** to set the state of the output relays at power-up. By default, this product is shipped with the switch for all banks configured for pull-up (modules inactive on power-up), as shown in Figure 2-4. When switched to **P/DN** (pull-down), modules are active on power-up. Switch settings can be read back via software.

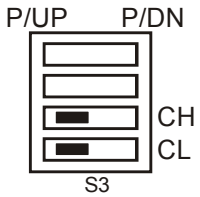


Figure 2-4. Relay power-up state switch (S3)

Connecting the external power supply

Power to the USB-SSR08 is provided with the 9 V, 1 A external power supply (CB-PWR-9). You must connect the external power supply *before* connecting the USB connector to the USB-SSR08.

To connect the power supply to your USB-SSR08, do the following:

1. Connect the external power cord to the power connector labeled **POWER IN** on the USB-SSR08 enclosure (**PWR IN** on the board).
2. Plug the AC adapter into a power outlet.

The **PWR** LED illuminates green when 9 V power is supplied to the USB-SSR08. If the voltage supply is less than 6.0 V or more than 12.5 V, the PWR LED does not light.

Do not connect external power to the POWER OUT connector

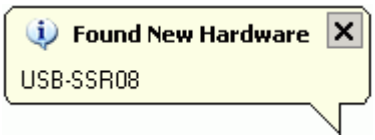
The power connector labeled **POWER OUT** on the enclosure (**PWR OUT** on the board) is used to provide power to an additional MCC USB Series product. If you connect the external power supply to the **POWER OUT** connector, the USB-SSR08 does not receive power, and the **PWR** LED will not illuminate.

Connecting the USB-SSR08 to your system

To connect the USB-SSR08 to your system, do the following.

1. Turn your computer on.
2. Connect the USB cable to the USB connector labeled **USB IN** on the USB-SSR08.
3. Connect the other end of the USB cable to a USB port on your computer or to an external USB hub that is connected to your computer. The **USB LED** illuminates green. The USB cable provides power and communication to the USB-SSR08.

When you connect the USB-SSR08 for the first time, a **Found New Hardware** popup balloon (Windows XP) or dialog (other Windows versions) opens as the USB-SSR08 is detected.



When installation is complete, the **USB** LED should flash and then remain lit. This indicates that communication is established between the USB-SSR08 and your computer.

If the USB LED turns off

If the USB LED is lit but then turns off, the computer has lost communication with the USB-SSR08. To restore communication, disconnect the USB cable, and then reconnect it. This should restore communication, and the USB LED should turn back *on*.

If you are running Windows XP and connect the USB-SSR08 to a USB 1.1 port, a balloon displays the message "**Your USB device can perform faster if you connect to a USB 2.0 port**." You can ignore this message. The USB-SSR08 will function properly when connected to a USB 1.1 port.

Caution! Do not disconnect **any** device from the USB bus while the computer is communicating with the USB-SSR08, or you may lose data and/or your ability to communicate with the USB-SSR08.

If your system does not detect the USB-SSR08

If a "**USB device not recognized**" message appears when you connect the USB-SSR08, do the following.

1. Unplug the USB cable from the USB-SSR08.
2. Unplug the external power cord from the **POWER IN** connector on the enclosure.
3. Plug the external power cord back into the **POWER IN** connector.
4. Plug the USB cable back into the USB-SSR08.

Your system should now properly detect the USB-SSR08 hardware. Contact technical support if your system still does not detect the USB-SSR08.

Functional Details

Internal components

The USB-SSR08 has the following internal components, as shown in Figure 3-1.

- Two (2) USB connectors
- Two (2) external power connectors
- PWR LED
- USB LED
- I/O module type switch (**S1**)
- Control logic polarity switch (**S2**)
- Power-up state configuration switch (**S3**)
- Screw terminals (eight pairs)

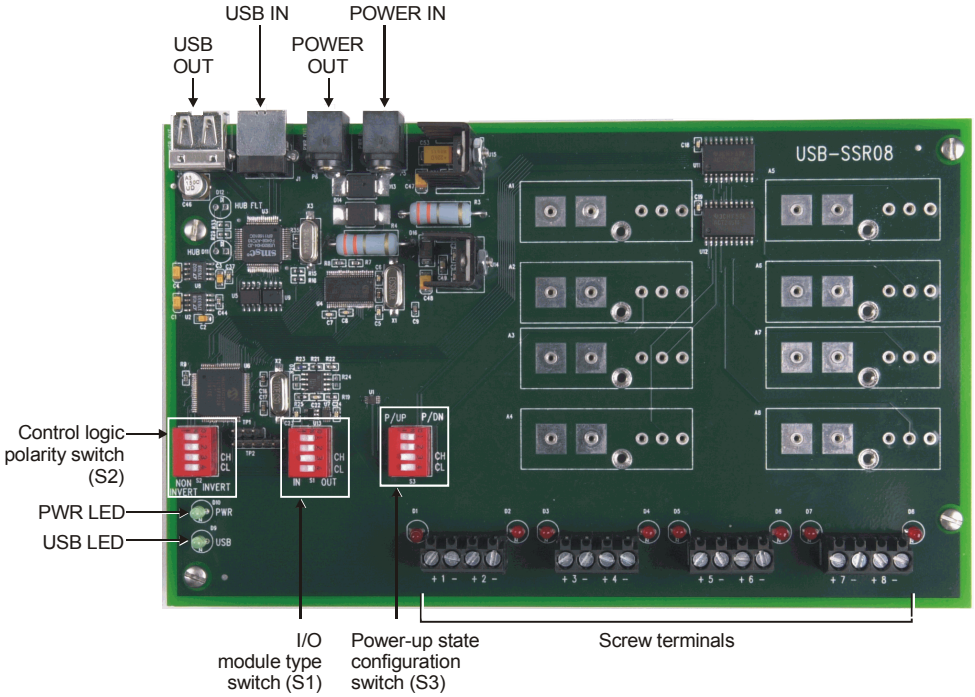


Figure 3-1. USB-SSR08 components

USB in connector

The USB in connector is labeled **USB IN** on the enclosure and on the board. This connector is a USB 2.0 full-speed input connector that you connect to the USB port on your computer (or USB hub connected to your computer). This connector supports USB 1.1, USB 2.0 devices.

USB out connector

The USB out connector is labeled **USB OUT** on the enclosure on the board. This connector is a downstream hub output port intended for use with other MCC USB Series products only. The USB hub is self-powered, and can provide **100 mA** maximum current at 5 V. For information on daisy chaining to other MCC USB Series products, refer to "Daisy chaining multiple USB-SSR08 devices" on page 3-4.

External power connectors

The USB-SSR08 has two external power connectors labeled **POWER IN** and **POWER OUT** on the enclosure. The **POWER IN** connector is labeled **PWR IN** on the board, and the **POWER OUT** connector is labeled **PWR OUT** on the board.

Connect the **POWER IN** connector to the supplied +9 V external power supply. External power is required to operate the USB-SSR08. The **POWER OUT** connector lets you power additional daisy chained MCC USB Series products from a single external power supply. Depending on your load requirements, daisy chained products may require a separate power supply. Refer to "Power limitations using multiple USB-SSR08 devices" on page 3-4 for more information.

USB LED

The **USB** LED indicates the communication status of the USB-SSR08. This LED uses up to 5 mA of current and cannot be disabled. Table 3-2 explains the function of the USB LED.

Table 3-2. USB LED Illumination

LED Illumination	Indication
Steady green	The USB-SSR08 is connected to a computer or external USB hub.
Pulsing green	Initial communication is established between the USB-SSR08 and the computer, or data is being transferred.

PWR LED

The USB-SSR08 incorporates an on-board voltage supervisory circuit that monitors the external 9 V power. If the input voltage falls outside of the specified ranges the **PWR** LED shuts off. Table 3-3 explains the function of the PWR LED.

Table 3-3. PWR LED Illumination

PWR LED illumination	Indication
Steady green	External power is supplied to the USB-SSR08.
Off	Power is not supplied by the external power supply, or a power fault has occurred. A power fault occurs when the input power falls outside of the specified voltage range of the external supply (6.0 V to 12.5 V).

I/O module type switch (S1)

Switch **S1** is a four-position switch that sets the type of each module group for input or output (default). You cannot mix input and output modules within a group. You can use *Insta*Cal to read the current I/O type configuration for each module group. Figure 3-2 shows switch S1 configured with its default settings.

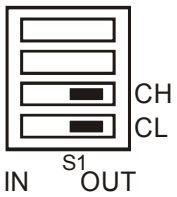


Figure 3-2. Switch S1 default configuration

Control logic polarity switch (S2)

Switch **S2** is a four-position switch that sets the control logic polarity for each module group for either inverted (active high) or non-inverted (active low, default). You can use *Insta*Cal to read the current logic configuration for each module group. Figure 3-3 shows switch S2 configured with its default settings.

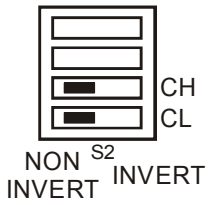


Figure 3-3. Switch S2 default configuration

Relay power-up state switch (S3)

Switch **S3** is a four-position switch that sets the state of the output relays at power-up. You can use *Insta*Cal to read the current resistor configuration for each module group. Figure 3-4 shows switch S3 configured with its default settings (modules inactive on power-up).

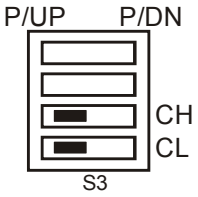


Figure 3-4. Switch S3 default configuration

Screw terminals

The USB-SSR08 has eight screw terminal pairs to connect external devices to the SSR modules. Two terminals are dedicated to each module (one positive and one negative terminal). Each screw terminal is identified with a label on the board and on the underside of the enclosure lid.

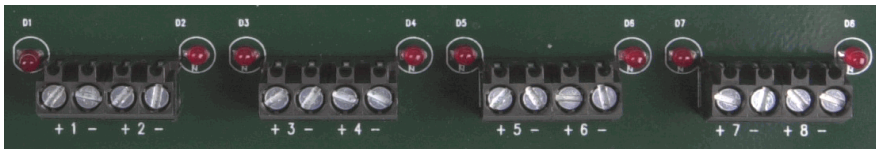


Figure 3-5. Screw terminals

Caution! Before connecting wires to the screw terminals, turn off the power to the USB-SSR08, and make sure that the signal wires do not contain live voltages.

Use 12-22 AWG wire for your signal connections. Properly insulate the wires to avoid any short circuit to the other channels, ground, or other points on the board.

Caution! **Keep the length of stripped wire at a minimum to avoid a short to the enclosure!** When connecting your field wiring to the screw terminals, use the strip gage on the terminal strip, or strip to 5.5 - 7.0 mm (0.215" to 0.275") long.

LED states

Independent LEDs (**D1** – **D8**) at each module position indicate the on/off status of each module. The LED illuminates when an output module is active (turned on) or when an input module detects an input voltage.

Daisy chaining multiple USB-SSR08 devices

Daisy chained MCC USB Series products connect to the USB bus through the high-speed hub on the USB-SSR08. You can daisy chain a maximum of four MCC USB Series products to a single USB 2.0 port or USB 1.1 port on your computer. Use the supplied cable or an equivalent cable when daisy chaining MCC USB Series products.

To daisy chain two or more USB-SSR08 modules, follow the steps below. This procedure assumes you already have one USB-SSR08 connected to a computer and to an external power source. The USB-SSR08 already connected to the computer is referred to as the *connected module*. The USB-SSR08 you want to daisy chain to the connected module is referred to as the *new module*.

1. Connect the **Power OUT** connector on the connected module to the **Power IN** connector on the new module.

   This step is required only if you plan to daisy chain power to another module.

2. Connect the **USB OUT** connector on the connected module to the **USB IN** connector on the new module

3. To add another module, repeat steps 1-2, with the module you just connected now being the *connected module*.

A daisy chain example is shown in Figure 3-6. Note that the last board in the chain is supplied with external power.

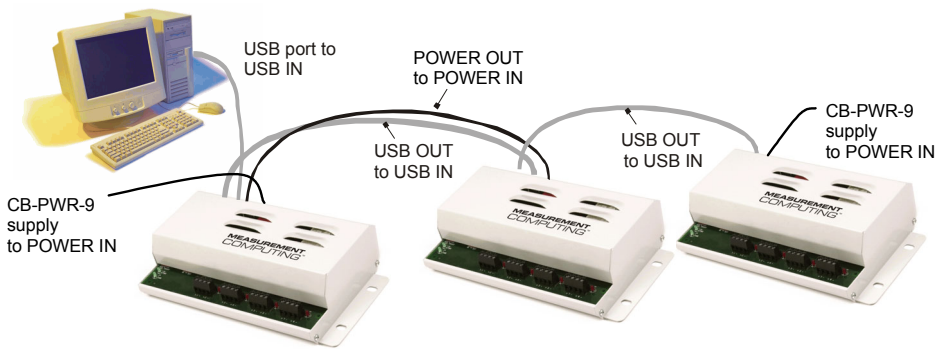


Figure 3-6. USB-SSR08 daisy chain connections

Power limitations using multiple USB-SSR08 devices

When daisy chaining additional MCC USB Series products to the USB-SSR08, you must ensure that you provide adequate power to each board that you connect. The USB-SSR08 is powered with a 9 VDC nominal, 1.0 A external power supply.

Voltage drop

A drop in voltage occurs with each board connected in a daisy chain system. The voltage drop between the power supply input and the daisy chain output is 0.5 V maximum. Factor in this voltage drop when you configure a daisy chain system to ensure that at least 6.0 VDC is provided to the last board in the chain.

Specifications

Typical for 25 °C unless otherwise specified.

Specifications in *italic text* are guaranteed by design.

I/O module configuration

Table 1. I/O module configuration specifications

Modules 1-4	User-selectable via switch S1 "CL" position as either input modules or output (default) modules. Switch settings for direction can be read back via software. Do not mix input and output modules within this bank of four.
Modules 5-8	User-selectable via switch S1 "CH" position as either input modules or output (default) modules. Switch settings for direction can be read back via software. Do not mix input and output modules within this bank of four.
Pull-up/pull-down on digital I/O lines	Configurable via switch S3 with 2.2 K ohm resistor network. Switch settings for pull-up/pull-down selection can be read back via software. Default to pull-up. Switch settings are applicable during power up conditions of output modules only. Modules are active Low. When switch to Pull-up, modules are inactive on power up. When switched to pull-down, modules are active on power up.
I/O module logic polarity	Selectable via switch S2. Switch settings for polarity can be read back via software. Default to non-inverted. For input modules, invert mode returns a “1” when module is active; non-invert mode returns a “0” when module is active. For output modules, invert mode allows users to write a "1" to activate the module; non-invert mode allows users to write a "0" to activate the module.

Power

Table 2. Power specifications

Parameter	Conditions	Specification
USB +5 V input voltage range.		4.75 V min. to 5.25 V max.
USB +5 V supply current	All modes of operation	<100 mA
External power supply (included)	MCC p/n CB-PWR-9	9 V ± 10% @ 1.0 A
Voltage supervisor limits - PWR LED	6.0 V > V_{ext} > 12.5 V	PWR LED = Off (power fault)
	6.0 V < V_{ext} < 12.5 V	PWR LED = On
External power consumption	All modules off, 0 A downstream hub power	180 mA typ, 220 mA max.
	All modules on, 100 mA downstream hub power	300 mA typ, 360 mA max.

External power input

Table 3. External power input specifications

Parameter	Conditions	Specification
External power input		+6.0 VDC to 12.5 VDC (9 VDC power supply included)
Voltage supervisor limits - PWR LED. (Note 1)	6.0 V > Vext or Vext > 12.5 V	PWR LED = Off (power fault)
	6.0 V < Vext < 12.5 V	PWR LED = On
External power adapter (included)	MCC p/n CB-PWR-9	+9 V ±10%, @ 1.0 A

Note 1: The USB-SSR08 monitors the external +9 V power supply voltage with a voltage supervisory circuit. If this power supply exceeds its specified limit, the PWR LED will turn off indicating a power fault condition.

External power output

Table 4. External power output specifications

Parameter	Conditions	Specification
External power output - current range		4.0 A max.
External power output (Note 2)	Voltage drop between power input and daisy chain power output	0.5 V max
Compatible cable(s) for daisy chain	C-MAPWR-x	X= 2 , 3, or 6 feet

Note 2: The daisy chain power output option allows multiple Measurement Computing USB boards to be powered from a single external power source in a daisy chain fashion. The voltage drop between the module power supply input and the daisy chain output is 0.5 V max. Users must plan for this drop to assure the last module in the chain will receive at least 6.0 VDC.

USB specifications

Table 5. USB specifications

USB "B" connector	Input
USB device type	USB 2.0 (full-speed)
Device compatibility	USB 1.1, USB 2.0
USB "A" connector	Downstream hub output port
USB hub type	Supports USB 2.0 high-speed, full-speed and low-speed operating points
	Self-powered, 100 mA max downstream VBUS capability
Compatible products	MCC USB Series devices
USB cable type (upstream and downstream)	*A-B cable, UL type AWM 2527 or equivalent. (min 24 AWG VBUS/GND, min 28 AWG D+/D-)*
USB cable length	3 meters max.

Digital I/O transfer rates

Table 6. Digital I/O transfer rate specifications

Digital I/O transfer rate (software paced)	System dependent, 33 to 1000 port reads/writes or single bit reads/writes per second typ.

Mechanical

Table 7. Mechanical specifications

Card dimensions without modules	203.2 mm (L) x 121.9 mm (W) x 22.5 mm (H)
	8.0" (L) x 4.8" (W) x 0.885" (H)
Enclosure dimensions	241.3 mm (L) x 125.7 mm (W) x 58.9 mm (H)
	9.50" (L) x 4.95" (W)x 2.32" (H)

Environmental

Table 8. Environmental specifications

Operating temperature range	*0 to 70 °C*
Storage temperature range	*-40 to 85 °C*

Humidity	*0 to 90% non-condensing*

Main connector

Table 9. Connector specifications

Connector type	Screw terminal
Wire gauge range	12 to 22 AWG

Screw terminal pin out

Pin	Signal Name
1+	Module 1+
1-	Module 1-
2+	Module 2+
2-	Module 2-
3+	Module 3+
3-	Module 3-
4+	Module 4+
4-	Module 4-
5+	Module 5+
5-	Module 5-
6+	Module 6+
6-	Module 6-
7+	Module 7+
7-	Module 7-
8+	Module 8+
8-	Module 8-

CE Declaration of Conformity

Manufacturer: Measurement Computing Corporation
Address: 10 Commerce Way
Suite 1008
Norton, MA 02766
USA

Measurement Computing Corporation declares under sole responsibility that the product

USB-SSR08

to which this declaration relates is in conformity with the relevant provisions of the following standards or other documents:

EU EMC Directive 89/336/EEC: Electromagnetic Compatibility, EN 61326 (1997) Amendment 1 (1998)

Emissions: Group 1, Class A

- EN 55011 (1990)/CISPR 11: Radiated and Conducted emissions.

Immunity: EN61326, Annex A

- IEC 1000-4-2 (1995): Electrostatic Discharge immunity, Criteria C.
- IEC 1000-4-3 (1995): Radiated Electromagnetic Field immunity Criteria C.
- IEC 1000-4-4 (1995): Electric Fast Transient Burst immunity Criteria A.
- IEC 1000-4-5 (1995): Surge immunity Criteria C.
- IEC 1000-4-6 (1996): Radio Frequency Common Mode immunity Criteria A.
- IEC 1000-4-8 (1994): Magnetic Field immunity Criteria A.
- IEC 1000-4-11 (1994): Voltage Dip and Interrupt immunity Criteria A.

Declaration of Conformity based on tests conducted by Chomerics Test Services, Woburn, MA 01801, USA in June, 2005. Test records are outlined in Chomerics Test Report #EMI4221.05.

We hereby declare that the equipment specified conforms to the above Directives and Standards.

Carl Haapaoja, Director of Quality Assurance

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